OCE 101

Introduction to Geotechnical Engineering

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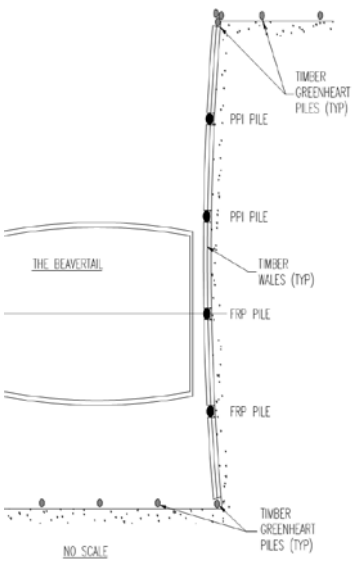
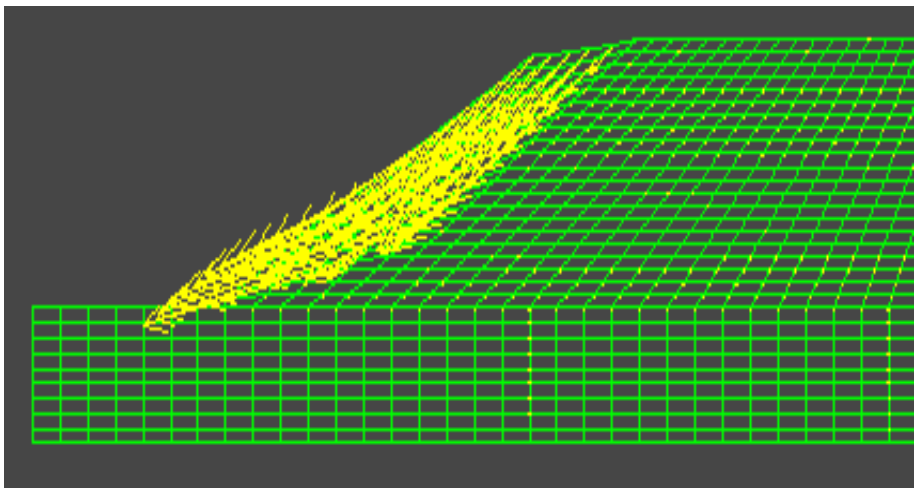
Introduction

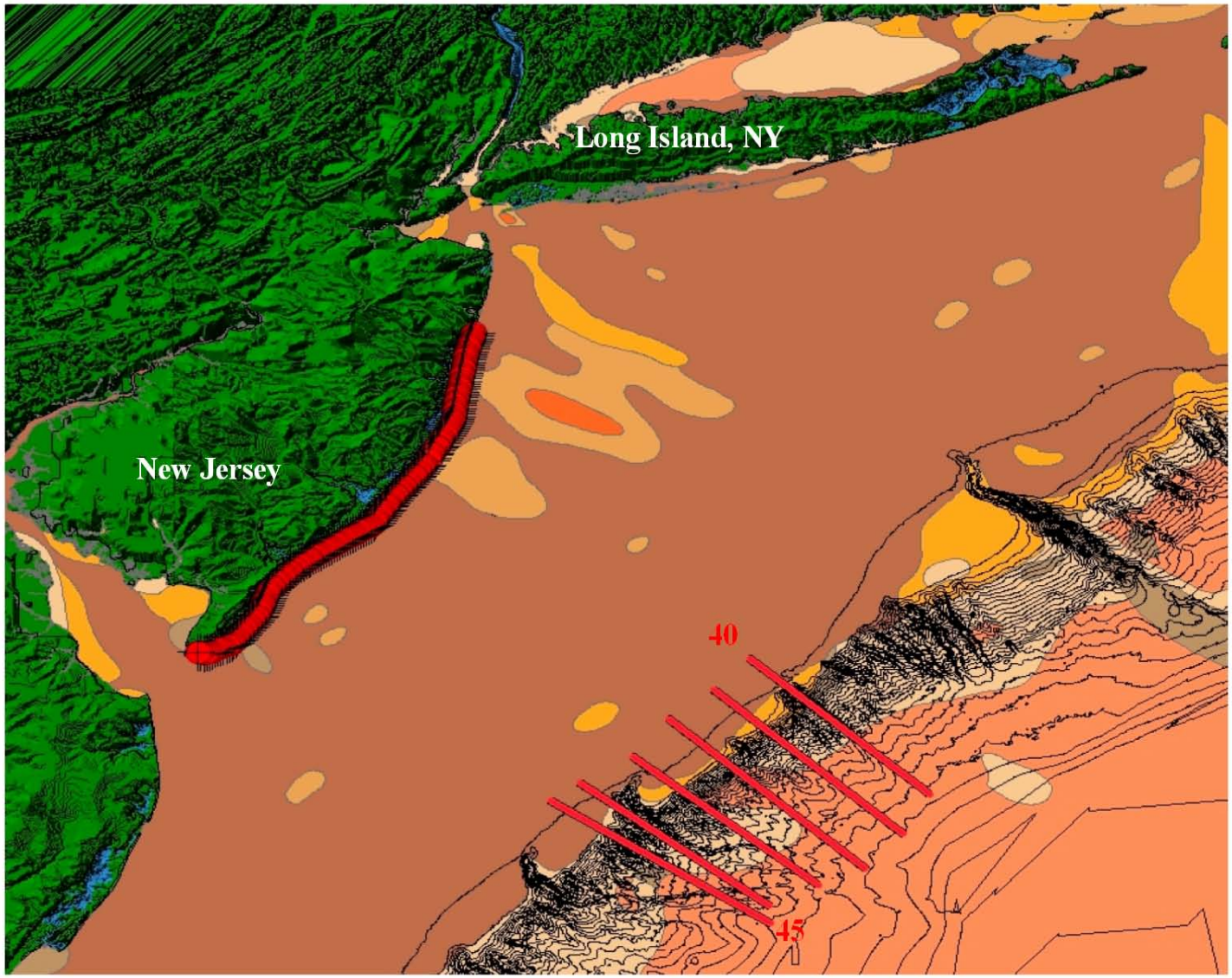




Recent Projects

- Technology assessment for offshore wind energy (RI Energy Office)
- Behavior of weakly cemented, oil-bearing sands (BP America, Inc.)
- Liquefaction potential of silts using shear wave velocity (RIDOT)
- Influence of gas bubbles on the undrained strength of clays (Norwegian Geotechnical Institute)
- Probabilistic Approach for Determining Submarine Landslide Tsunami Hazard along the Upper East Coast of the United States (FM Global, Inc.)

Investigation of Submarine Landslides along the New England Margin with Implications to Tsunami Hazards



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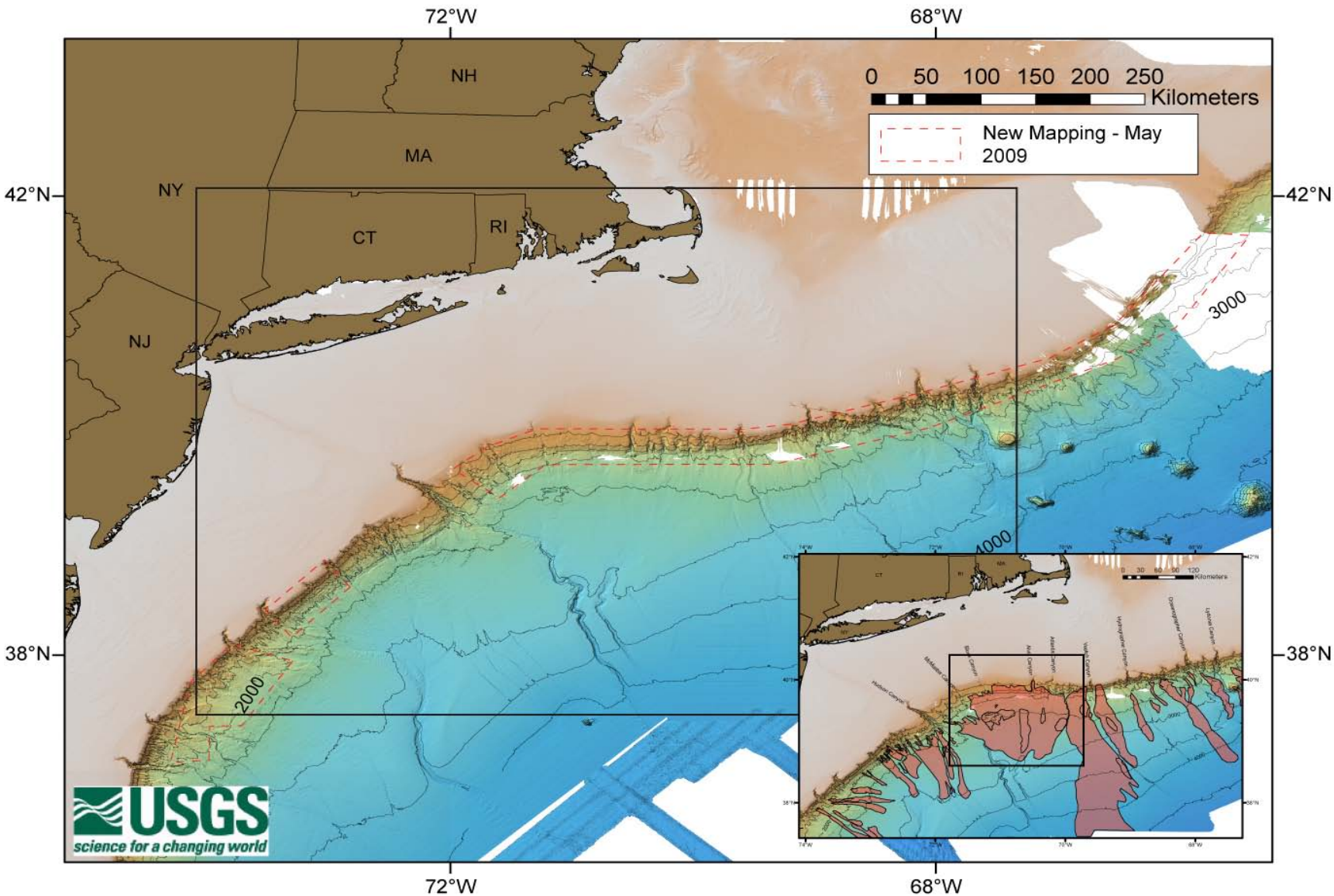

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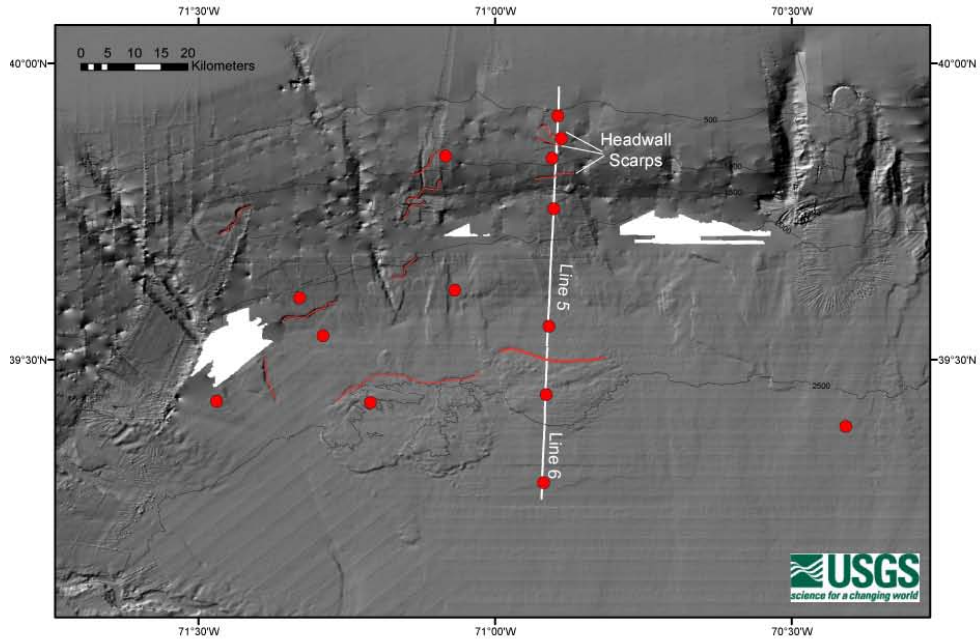
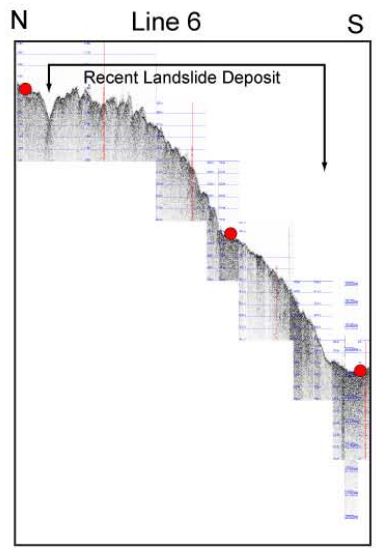




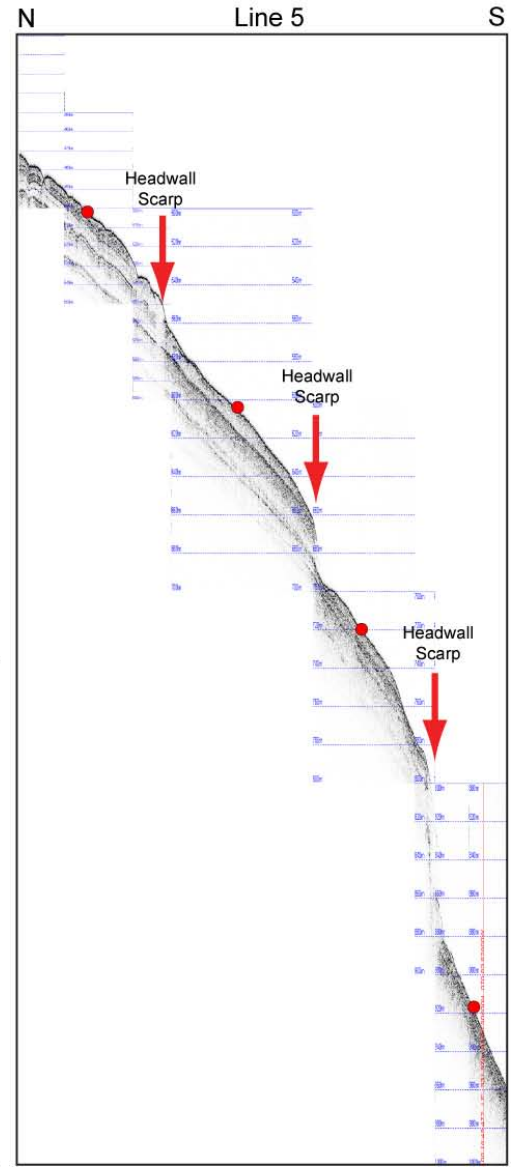
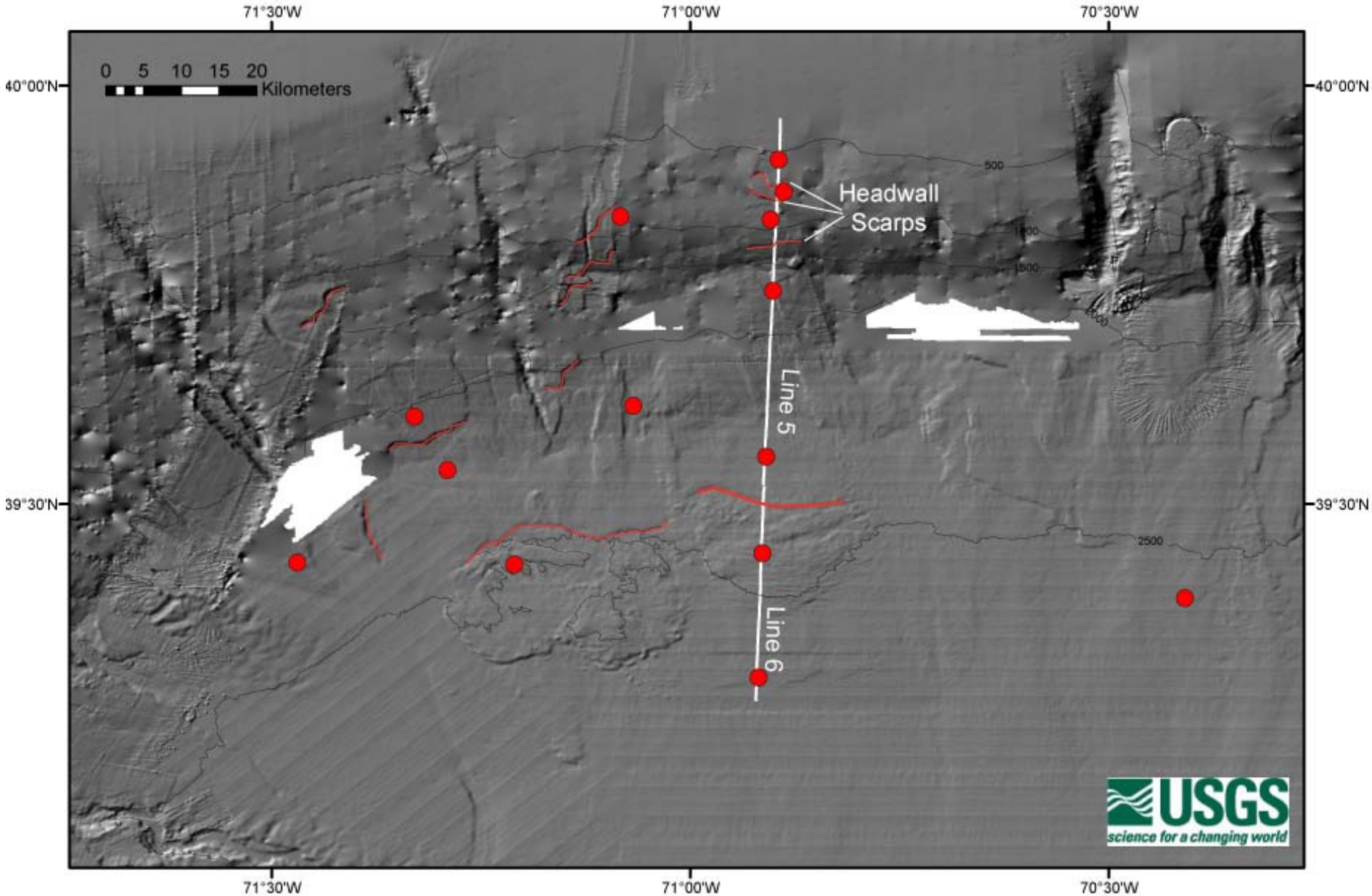


Figure 2. Potential coring sites (red circles) along the Southern New England slope and rise. Some of the numerous headwall scarps of several landslides are shown on the map (red lines) and the 3.5 kHz chirp profiles. The coring sites are located to intersect landslide and non-landslide deposits to provide detail on the stratigraphy of the region, as well as to allow dating of individual landslide deposits.

Investigation of Submarine Landslides along the New England Margin with Implications to Tsunami Hazards



What is Geotechnical Engineering?

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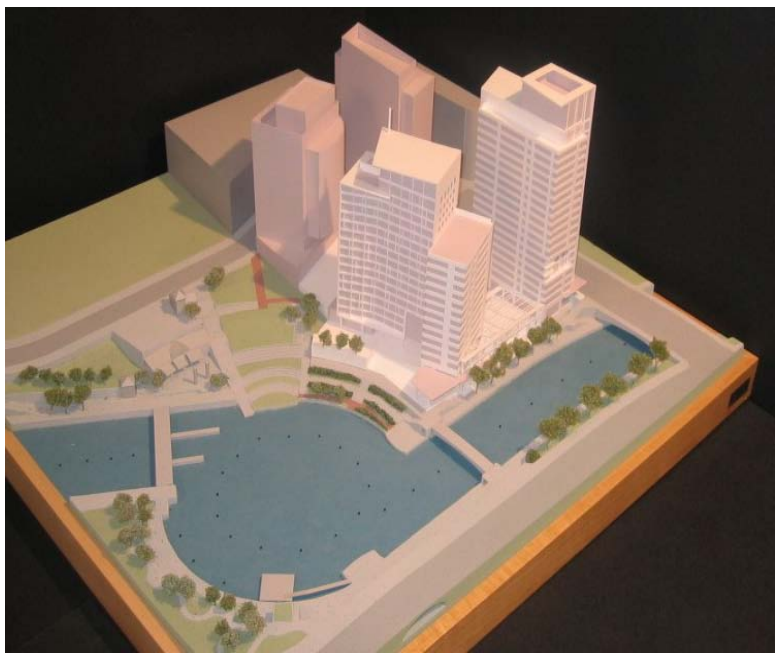
- Design and construction
- Mitigation of hazard risk
- Provision of infrastructure
- Natural resource recovery and utilization
- Environmental protection and enhancement

Design and Construction



Waterplace, Providence, RI
GZA Geoenvironmental, Inc. (2004)

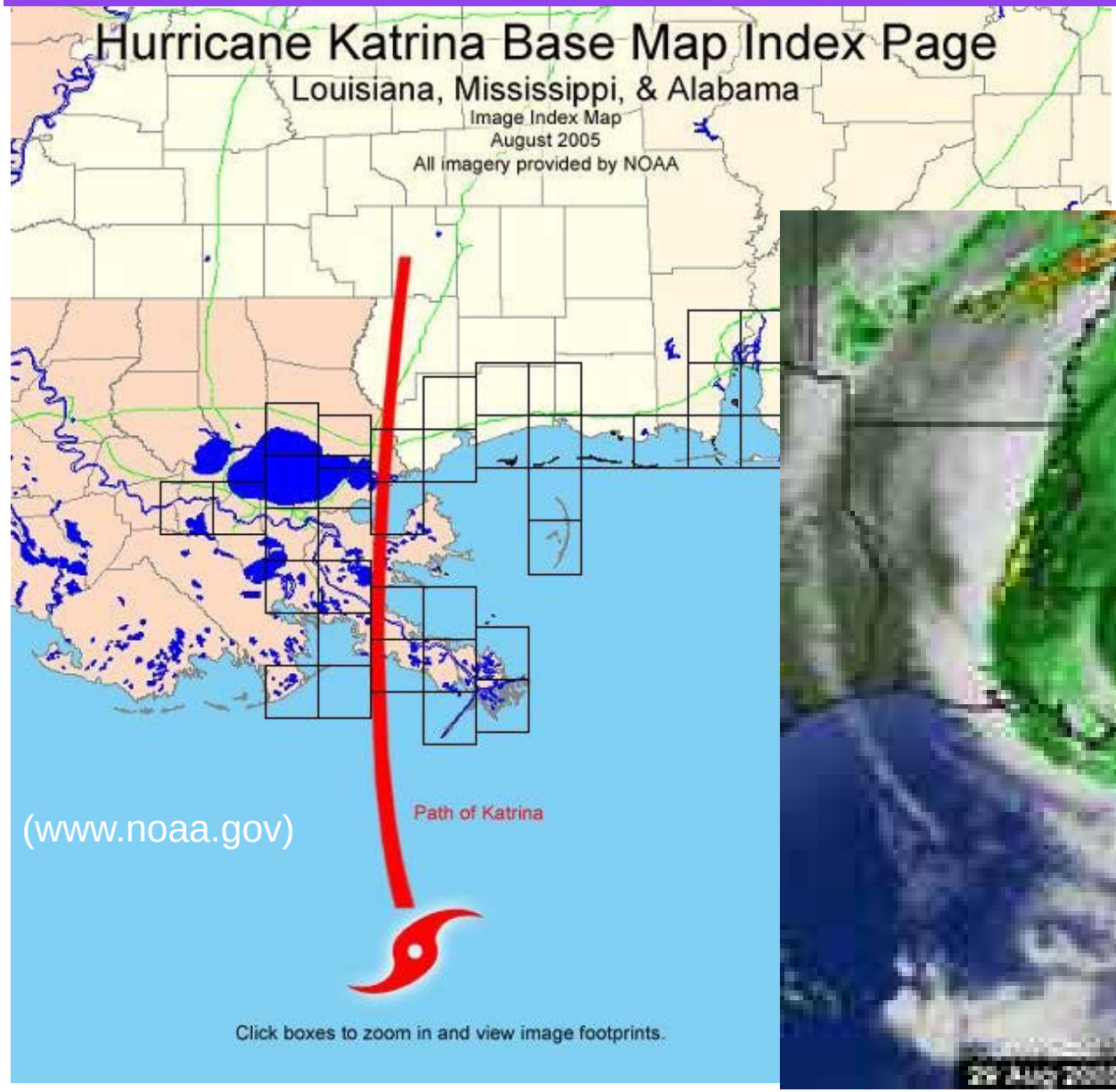
Design and Construction

Silver Springs Home Depot, Providence (2002)

Design and Construction

Bulkhead Repair, Newport (2001)

Hazard Mitigation



(www.noaa.gov)

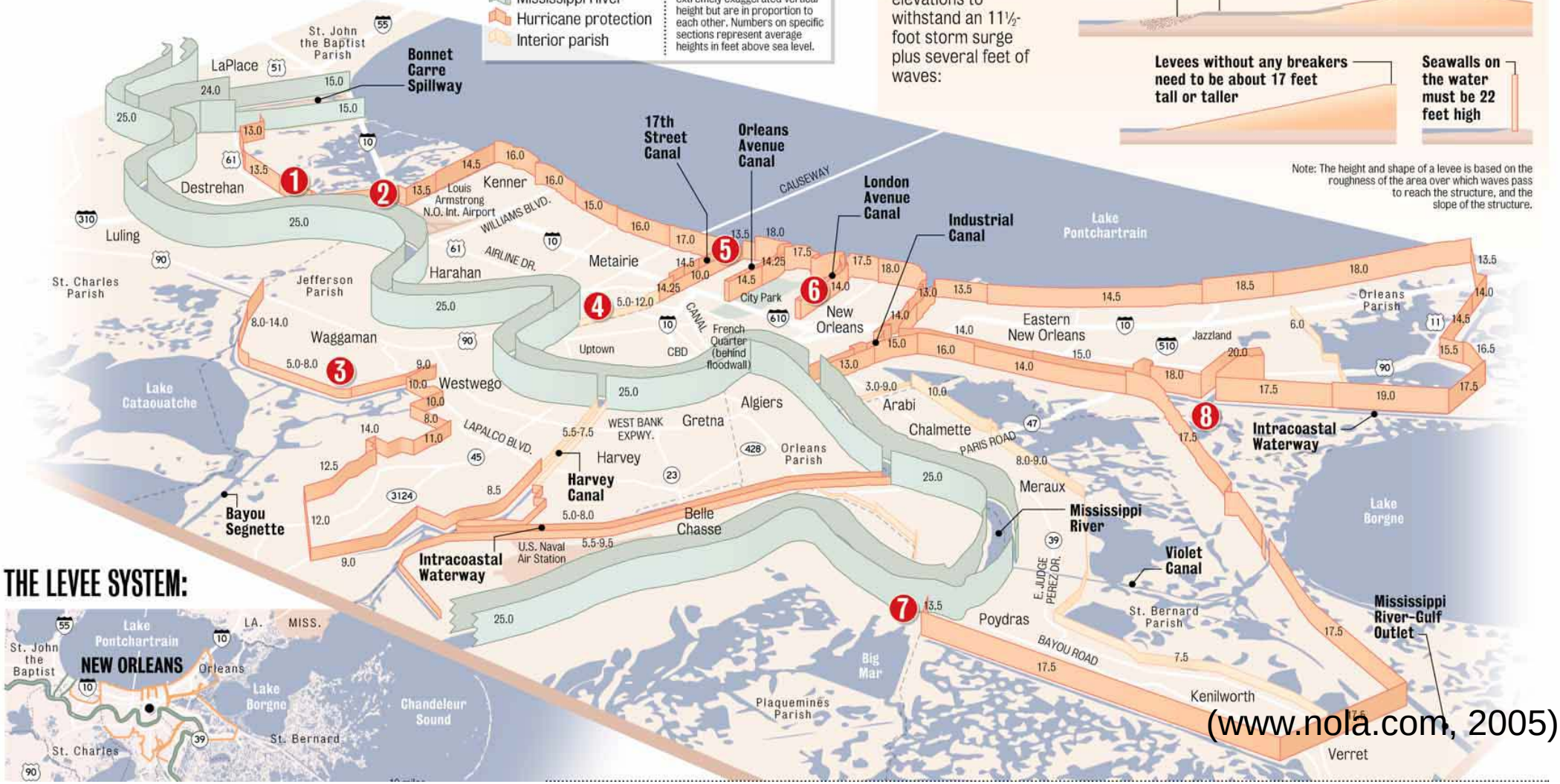
Path of Hurricane Katrina (category 3)

LAST LINE OF DEFENSE: HOPING THE LEVEES HOLD

Army Corps of Engineers officials say hurricane levees in the New Orleans area will protect residents from a Category 3 hurricane moving rapidly over the area. But computer models indicate even weaker storms could find chinks in that armor.

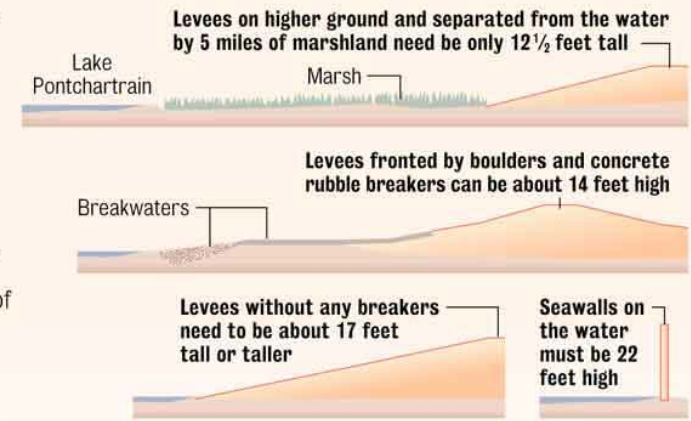
BARRIERS OF EARTH AND CONCRETE

Levees and floodwalls that protect against flooding from both the Mississippi River and hurricanes are built by the Army Corps of Engineers and are maintained by local levee districts. The corps and the local districts share the construction cost of hurricane levees, while the Mississippi River levees are a federal project. Local levee districts also build and maintain nonfederal, lower-elevation levees with construction money from each district's share of property taxes and state financing.



HEIGHT ISN'T EVERYTHING

Different factors permit Lake Pontchartrain levees of varying elevations to withstand an 11½-foot storm surge plus several feet of waves:



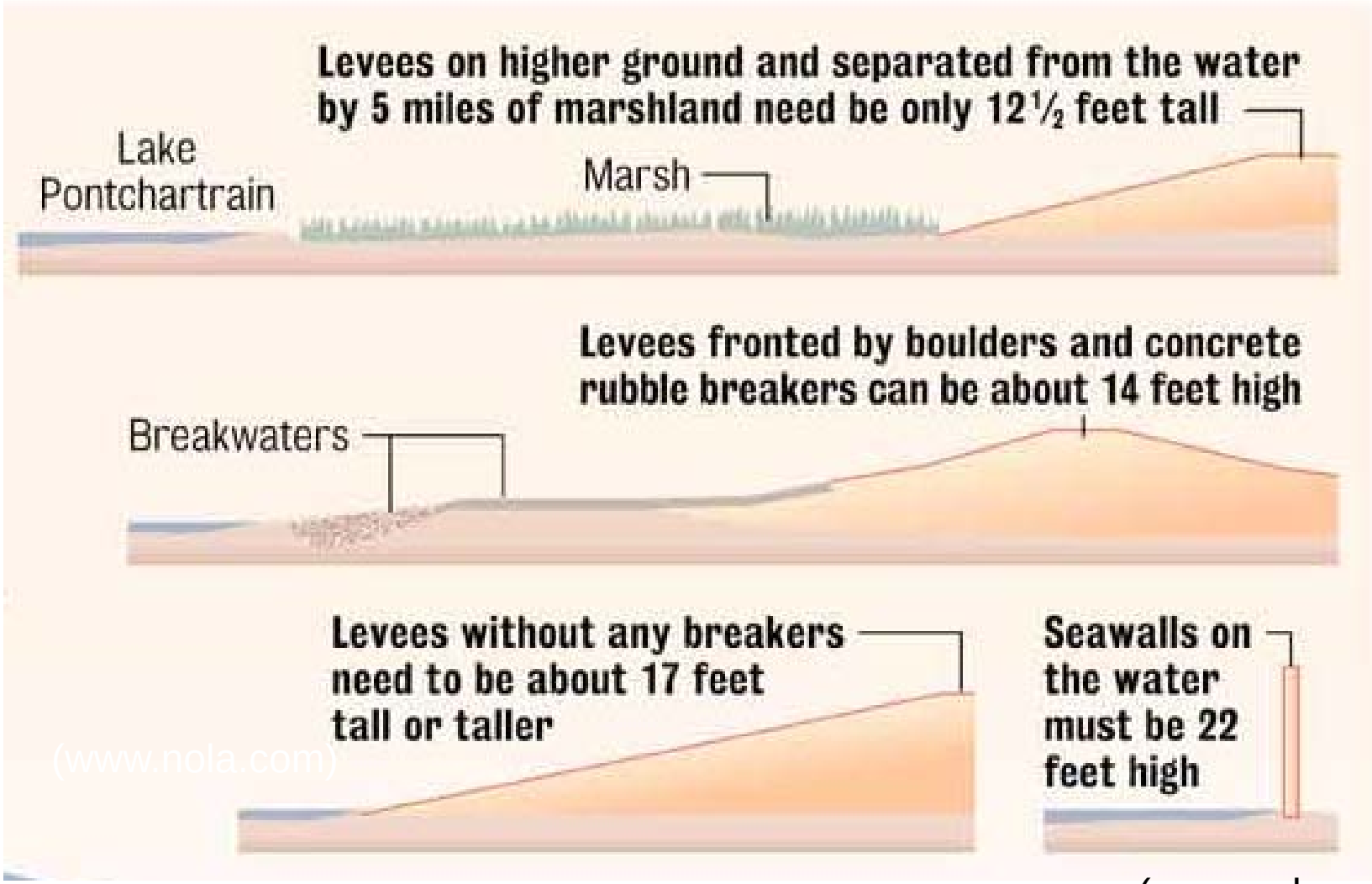
Note: The height and shape of a levee is based on the roughness of the area over which waves pass to reach the structure, and the slope of the structure.

THE LEVEE SYSTEM:

(www.nola.com, 2005)

Hazard Mitigation

LEVEES OF NEW ORLEANS

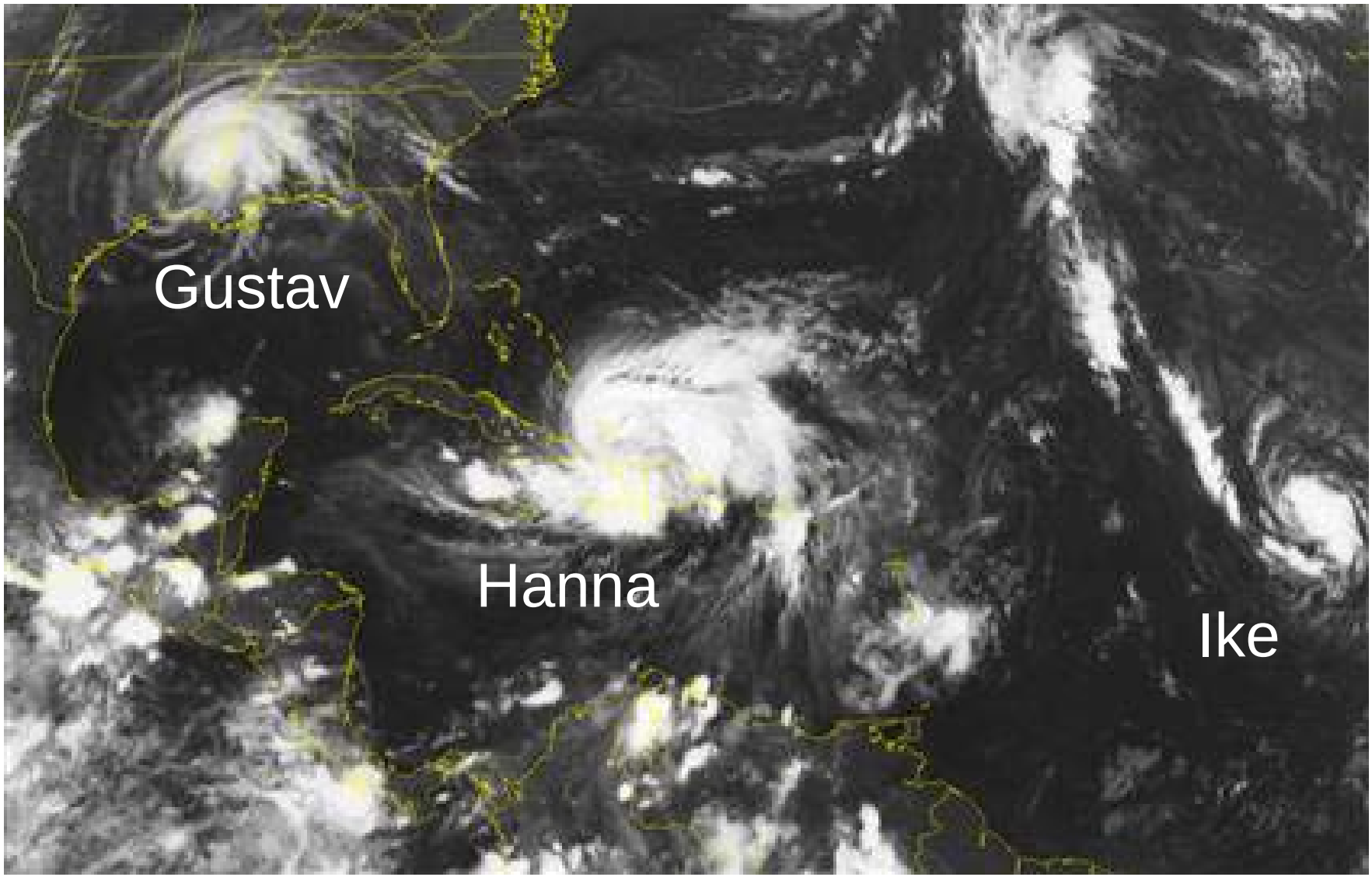


(www.nola.com, 2005)

Hazard Mitigation

LEVEES OF NEW ORLEANS, HURRICANE KATRINA

Hazard Mitigation



(www.cnn.com, September 2, 2008)

Hurricane Gustav Slams West New Orleans - Photos - WDSU New Orleans - Mozilla Firefox

http://www.wdsu.com/slideshow/weather/17358347/detail.html

Water from the industrial canal laps over the levee as Hurricane Gustav strikes the Gulf Coast September 1, 2008 in New Orleans, Louisiana. Gustav made landfall as a Category 2 storm near

Hurricane Gustav Slams West New Orleans - Photos - WDSU New Orleans - Mozilla Firefox

http://www.wdsu.com/slideshow/weather/17358347/detail.html

Water sloshes over the side of a levee on Industrial Canal in New Orleans, Louisiana, September 1, 2008.

Hurricane Gustav Slams West New Orleans - Photos - WDSU New Orleans - Mozilla Firefox

http://www.wdsu.com/slideshow/weather/17358347/detail.html

Water splashes over the side of a levee on the Industrial Canal in New Orleans, Louisiana, on September 1, 2008 due to Hurricane Gustav. A new tropical depression formed in the central

Infrastructure

Providence River
Dredging Project

www.savethebay.org

Natural resource recovery and utilization

Molikpaq

Natural Resource Recovery and Utilization

Reference Installation - Offshore Wind Farm Samsø, Denmark (2002)

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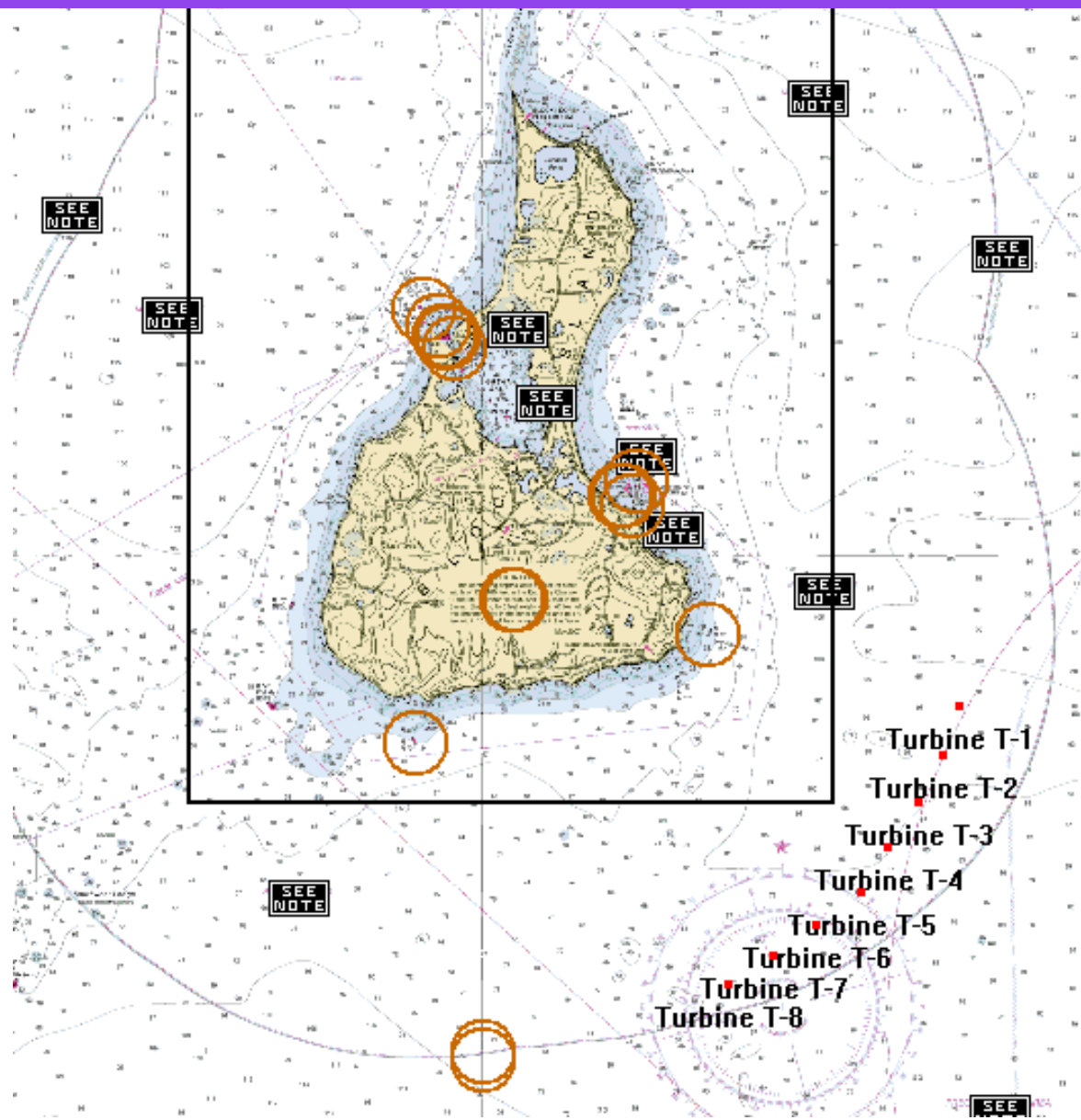
Why Geotechnical Engineering is Important

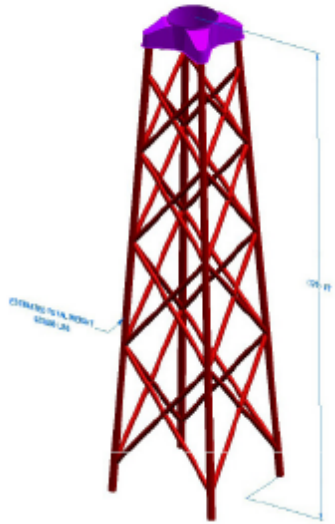
- Everything built on, in, or with the earth
- Soil is the most abundant construction material
- Most resources from the earth
- Waste disposal on and in the earth

Onshore Wind Construction

DEEPWATERWIND


SEE NOTE
Turbine T-1
Turbine T-2
Turbine T-3
Turbine T-4
Turbine T-5
Turbine T-6
Turbine T-7
Turbine T-8

Deep Water Wind Jacket



The DWW Jacket

Typical Parameters

- *Next Generation foundation*
- *Suitable for larger turbines*
- *Pile Diameters to 6 feet (2M)*
- *Lengths to 164 feet (50-60M)*
- *Used in deeper water father offshore*
- *Suitable for use in depths to 150'(M)*
- *Installed by driving with standard hammer*
- *Some drilling required in harsh seabed*
- *Standard Geo-tech empirical testing*
- *3 Piling options: Thru legs, skirt piles or pre-piled thru template*


DOSECCA


WAN HAI
WHLU 204348
22G1
DOG HOUSE
WATERTIGHT DOOR
KEEP CLOSED
WHILE AT SEA

Future

- Block Island Wind Farm Project -20 MW
- Utility Scale Rhode Island Project - 385 MW